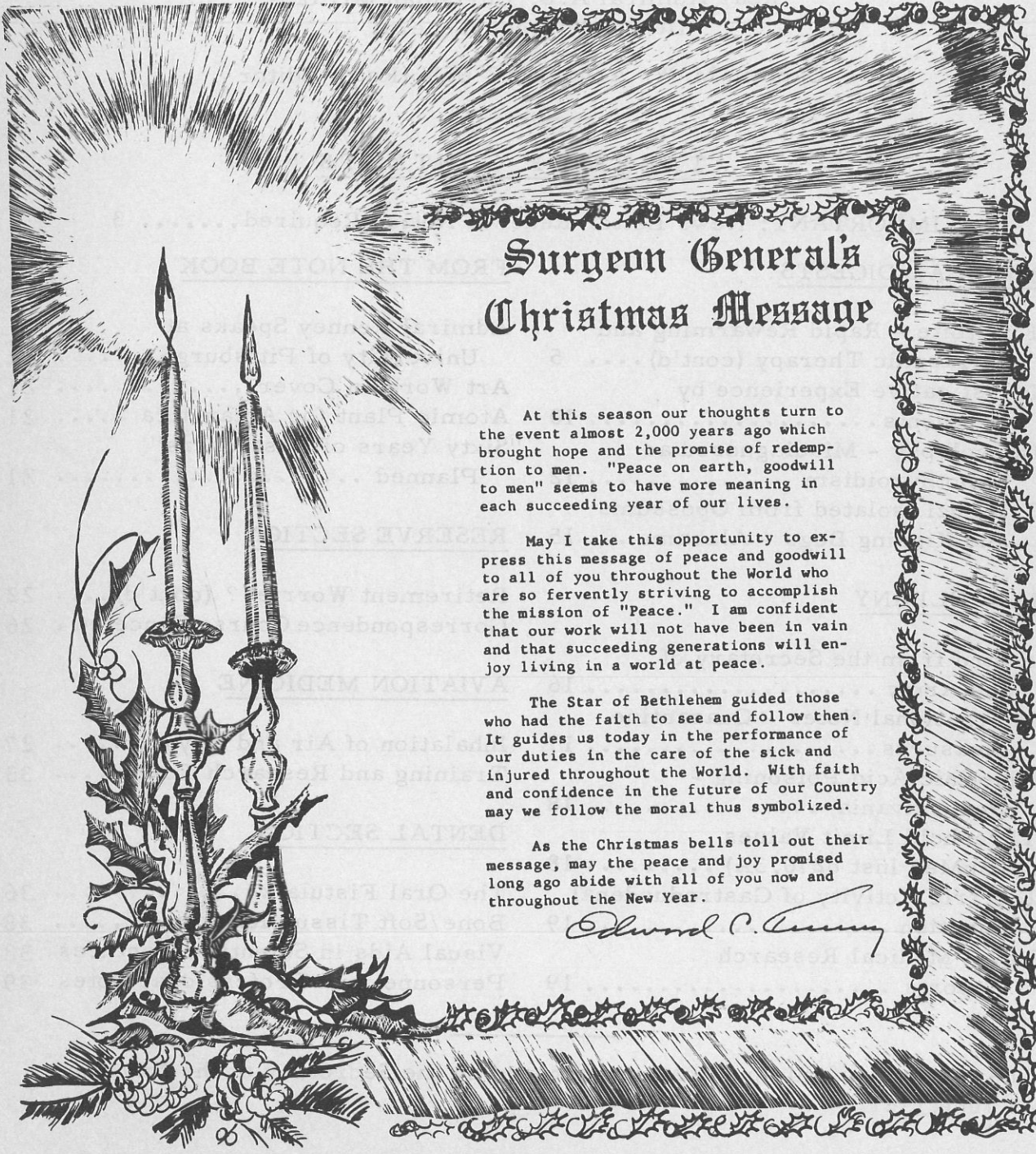




UNITED STATES NAVY

## MEDICAL NEWS LETTER



## Surgeon General's Christmas Message

At this season our thoughts turn to the event almost 2,000 years ago which brought hope and the promise of redemption to men. "Peace on earth, goodwill to men" seems to have more meaning in each succeeding year of our lives.

May I take this opportunity to express this message of peace and goodwill to all of you throughout the World who are so fervently striving to accomplish the mission of "Peace." I am confident that our work will not have been in vain and that succeeding generations will enjoy living in a world at peace.

The Star of Bethlehem guided those who had the faith to see and follow then. It guides us today in the performance of our duties in the care of the sick and injured throughout the World. With faith and confidence in the future of our Country may we follow the moral thus symbolized.

As the Christmas bells toll out their message, may the peace and joy promised long ago abide with all of you now and throughout the New Year.

*Edward C. Querry*

United States Navy  
MEDICAL NEWS LETTER

Vol. 38

Friday, 15 December 1961

No. 12

Rear Admiral Edward C. Kenney MC USN  
Surgeon General  
Rear Admiral A.S. Chrisman MC USN  
Deputy Surgeon General  
Captain M. W. Arnold MC USN (Ret), Editor

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The issuance of this publication approved by the Secretary of the Navy on  
28 June 1961.



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FROSTBITE: EXPERIENCE WITH RAPID REWARMING  
AND ULTRASONIC THERAPY  
(continued)

William J. Mills Jr, Robert Whaley, and Winthrop Fish, Anchorage, Alaska. ALASKA MEDICINE, Part III, \* Vol. 3, No. 2, June 1961.

From review of the data in Part II it is apparent that the elimination of freezing injury is improbable. A decrease in incidence is possible with proper prophylaxis. General knowledge of proper clothing, especially hand and foot gear, and care and use of such gear when in freezing temperatures are essential. Basic information regarding the mechanism of heat production and loss resulting from the effect of activity, fatigue, sweating, shivering, wind exposure, and wet clothing should be made available to winter travelers in the Alaskan area.

Methods of care in the event of unavoidable trauma to the person should be taught those whose occupation or avocation permits exposure in the Arctic or sub-Arctic. Neither here nor elsewhere has a solution been found nullifying the effect of neglect, carelessness, alcoholic intoxication, accident, or assault that were contributing causes in this series.

Regardless of cause, it is interesting that only six of fifty-one subjects were persons not oriented or acclimatized to Arctic or sub-Arctic conditions. Most of the severe injuries occurred in lifetime or longtime residents in Alaska.

The effect of possible training and conditioning on resistance to cold injury is still a highly controversial subject. In this respect, the relative paucity of cases of hand injuries among Native peoples in Alaska is striking. Longtime Caucasian residents in the Alaska wilderness as well as the Native people traditionally utilize the hands fishing and working in the cold to a greater extent than urban dwellers and military personnel.

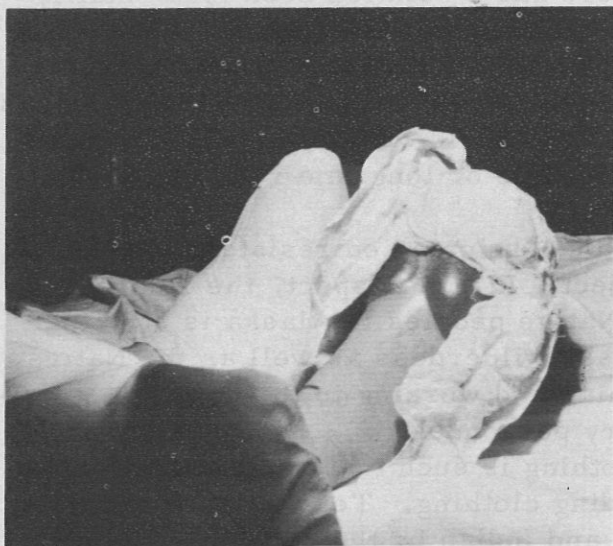
The construction of Native fur clothing is such that heat control of the body is quite difficult by removing or adding clothing. Temperature regulation often is accomplished in the Eskimo and Indian by the removal of gloves even in sub-zero weather, and the utilization of face and hand circulation as a heat radiator. The work of Irving, Nelms, and Ellsner (1) has demonstrated the greater ability of the Arctic Indian to perfuse his hands when subjected to cold exposure. He is able to achieve hand vasodilation more rapidly after cold stress, to achieve a much higher flow rate, and to sustain it despite general body chilling in differences that are marked over the normal white control subject.

The difference is such that these people are able to work continuously for long periods with hands in water at freezing temperatures during their winter fishing or other activity without obvious incapacity. Whites living a similar existence demonstrate an ability in this respect intermediate between the two groups mentioned. It is worthy of note that the Eskimo does not

acclimatize his foot circulation in similar fashion. In many patients the onset of freezing was apparent and gradual. A number of patients were aware of the danger besetting them, but were forced to choose between extremity freezing and survival. In some with associated injury to head, trunk, or limb no choice was available. Only great determination to survive or opportune discovery prevented eventual death from general hypothermia.

The initial treatment of freezing injury—as in any trauma—is one of first aid. Superficial skin involvement may be treated by warming the frozen part (especially head and face area) with a warm hand. Feet and hands may be warmed by contact with skin under protective clothing and gloves and foot-gear may be changed or dried. Shelter, if available, resolves many of these problems.

In cases of severe frostbite occurring on the trail, it is the authors' impression at present that the limb may best be left in its frozen state until rescue is performed or shelter obtained. At that time, more definitive care, particularly rapid rewarming in a water bath, may be offered. There is good cause to feel this is proper.



*Fluff dressing under adhesive gauze, for transport. Blebs still intact after 24 hours of travel.*



*Deep freezing injury, 24 hrs, post rapid rewarming, early bleb development.*

Travel may be possible on a frozen foot or feet that remain so, and survival may depend upon this. After thawing, travel is difficult, if not impossible, on the extremity that is swollen, painful, hyperemic, and blistered. If further travel is necessary, after thawing and in the same freezing environment, the danger of refreezing is likely and seldom is the result other than disastrous. Severe tissue loss in a recent Mt. McKinley climber (not included in this series) appeared due to a freezing injury followed by thawing and then, on further ascent, refreezing. The tabulations of the authors demonstrate that the total duration of freezing is not correlated with the final degree of injury



and may indicate that the final result is less a function of duration of freezing and more a function of method of thawing, particularly the rapidity of thawing or rewarming.

The authors believe their data are not conclusive on this point, but highly suggestive. As more cases accumulate, this problem will be given much attention. It appears that little is lost by permitting the extremity to remain frozen or cold if rewarming may be anticipated in the reasonable future.

### Thawing Methods

Their data seem to indicate clearly that the use of dry heat is hazardous because of the danger of raising tissue temperatures above the limit of viability, especially tissues previously traumatized by excessive cold. Aside from this, superficial injuries can be treated by almost any method with usually good results. At least no great difference in result was demonstrated in this small series other than a definite earlier return to normal sensation and appearance in the extremities rapidly rewarmed in a water bath.

Following deep injury, the best results were obtained in those cases rewarmed in a water bath as described. This method is more painful in its initial stage, resulting in increased hyperemia and larger blebs or bullae. The pedal pulses often are "pounding" after warming, and the blebs usually extend distalward to include even the terminal phalanges. Because of the extreme reaction, particularly the edema and bleb formation, this is not a "trail therapy."

Although results from gradual thawing or thawing at room temperature in superficial injury appear not different statistically from other methods, there is obvious evidence clinically in the deep injury cases that this method yields poor results often associated with considerable tissue loss.

The treatment of deep frostbite by ice, ice water immersion, or snow plainly results even in this small series in greater tissue loss. It appears to have little theoretical or experimental basis to recommend it. It is likely that this traditional method arose from, first, the lessened pain and discomfort in this method of thawing, particularly in superficial injury, and from obviously disastrous results of the application of external dry heat.

This effect of excessive dry heat probably accounted for the severe gangrenous results reported by Larrey during Napoleon's retreat from Moscow. This report was so often quoted in the cold injury literature that rewarming at temperatures greater than body temperature was for many years rejected and only recently received encouragement from the published work of Aryev (2), Crismon and Fuhrman (3), and Meryman (4).

### General Management

Prior to thawing, transport of the individual or handling of the frozen extremity is ordinarily not a problem. The limb itself is splinted by cold and requires only that tight gear be loosened. If thawing has occurred, the part may be

covered with loose fluffs, surrounded by adhesive gauze or elastic dressings to prevent bleb rupture. If none of these dressings are available, then transport is difficult. The friable edematous tissues, often covered with blebs, may be injured during travel. Maceration and trauma to these tissues increase the risk of infection.

After recovery from general body hypothermia, if present, and rewarming of the part, patients began the previously described frostbite regimen. The initial examination is particularly important in the alcoholic, irrational, and often hypothermic patient. This patient is most difficult to manage, especially prior to return to the homeothermic state.

Management of the accident victim may become a problem in therapy since frostbite often is secondary to dislocation, fracture, or crush injury of the extremity. These cases present combined technical difficulties other than the method of rewarming and frostbite care and, as a group, are deserving of more study. Treatment here is particularly directed to preservation of the peripheral vascular system.

Dislocations or fractures which embarrass circulation by pressure must be reduced and placed in such alignment as to prevent ischemia. Traction which increases vasospasm is obviously contraindicated. Open reduction in an area of frostbite is hazardous.

After placement of the cradle for the lower extremities or sterile sheets for the upper extremities, the patient is equally dependent for a good result upon capable and understanding nursing care. This is especially true when the gangrenous changes are advanced. The frostbitten extremity is not "pretty" and often repels both nurse and patient. Very cold or very warm liquids should not be in contact with the insensitive extremity in order to avoid further tissue embarrassment. Extremes of heat or cold may precipitate further gangrenous change. Control of infection (so ready to occur in these tissues) demands aseptic nursing technic. Clean gowns and masks are essential in the early edematous hyperemic stages.

The irrational alcoholic or belligerent patient must be prevented from weight bearing which might cause maceration of blebs and tissue contamination. In the event of inability to control such a patient (and in one where technics of restraint might be most difficult because of the involvement of the areas where restraints must be placed) special handling is necessary. The authors have found an Unna paste boot or even a light plaster cast over fluff dressings to be satisfactory in the early stages in such patients. As soon as the patient is rational, these must be removed to permit a continuation of physiotherapy. Smoking is discouraged under this program.

A bright, cheerful hospital environment, ward area, or private room is essential. Attendants and nurses must radiate confidence and render support. If deep or superficial gangrenous changes occur, with or without the associated odor, it is even more important not to set these patients away by themselves where they are unlikely to receive a normal degree of ward care and consideration. In fact, they require more care than most patients. Gentle handling of the extremities is necessary to prevent premature bleb rupture



and tissue trauma or contamination. The authors have found little promise in the use of vasodilators, anticoagulants, sympathetic block or sympathectomy in the early acute frostbite cases. They state, however, that their own experience with these measures is limited. Narcotic drugs have posed a considerable problem in the past. These patients often become dependent upon such drugs, even dependent upon the use of tranquilizing drugs. Few of them require sedation or analgesia after the first 72 hours. Much of their discomfort is the result of fear and concern. Most analgesic or narcotic drug therapy can be replaced by an encouraging bedside manner and a running explanation of the medical problem on daily rounds. It is essential that the attending physician and the nurses be patient and realize that with adequate treatment and care, particularly after rapid rewarming, results will generally be much better than expected. As necrosis develops and color changes become more marked, it is important to know that, in all probability, fine epithelial tissues are growing below this superficial eschar. Little is lost at this point in delaying definitive procedures of any kind that are destructive of tissue. Often, a pleasant surprise awaits both physician and patient when debridement is delayed or avoided and physiologic healing permitted.

#### Whirlpool, Physiotherapy, and Ultrasound

Physiotherapy serves at least two purposes. First, its active use (quite important from a functional viewpoint) permits patient participation in the therapy. The patient may leave his bed for definitive care, thereby altering his environment. At least once a day, travel to the therapy area may well be a considerable morale boost, particularly in the case of bedridden patients or those hospitalized for 30 to 150 days. The patient, too, is able to measure his progress by gradual increase in range of motion of the digits and the return of more normal sensation. The use of whirlpool with Hexachlorophene (R) detergent, cleanses the part of surface bacteria and performs a physiologic atraumatic debridement as well as permitting a stimulating massage of tissues. The difference in prevalence of severe infection in this series between those who did and did not receive whirlpool treatments is striking. There is little odor following the use of whirlpool as compared with patients who did not have this form of therapy. Whirlpool, also, possibly increases local circulation. It has appeared to cause rapid diminution of edema.

Pain is readily relieved after serial whirlpool. Patients, regardless of rewarming methods, tend to exercise the extremities while in whirlpool more than while lying in bed. Hand exercises are made easier and are more likely to be performed regularly during and after whirlpool therapy, especially after the blebs have dried and sterile fluffs are utilized for pressure exercises (squeezing).

The authors have found ultrasound to be both help and hindrance. In cases of superficial injury, there is subjective evidence of benefit. Some patients report "improved" sensation and ease of interphalangeal joint motion. In several, assuming the cold injury to be nearly symmetrical in both

extremities, with only one receiving ultrasound, there appeared a measurable change. Increased interphalangeal joint motion and increased sensory return were marked. There was visual evidence of an increase in vascularity of fingers and toes, particularly noted immediately after the use of ultrasound. With deep injury or in the type of C and D results (See previous News Letter article) there is cause to believe from the sensation reported (boring pain or dull ache) and from the appearance (hastened necrosis in some) that the use of ultrasound is harmful.

In some cases after ultrasound, particularly those thawed by ice and snow and in a few slowly warmed at room temperature, dry gangrenous tissues soon became wet. Liquefaction of the distal tissues was hastened in these. In further control groups of approximate equal injury to each extremity, ultrasound has shown its ability to cause resolution of the blebs many days ahead of the opposite untreated extremity. At the third or fourth week, however, no difference was generally exhibited between those extremities.

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\* Parts II and III of these studies were aided by Contract Nonr 3183 (00) (NR 105-249) between the Office of Naval Research, Department of the Navy, and William J. Mills Jr, M.D.)—Editor

\* \* \* \* \*

#### Investigative Experience by Residents

Victor Johnson MD PhD, Director, Mayo Foundation for Medical Education and Research. From The Proceedings of the Staff Meetings of the Mayo Clinic, Rochester, Minn., 36:559-561, October 25, 1961.

The chief interest of most of the 642 fellows of the Mayo Foundation is clinical. They are primarily residents in the hospital and outpatient training programs in internal medicine, general surgery, and the various specialties of medicine and surgery. Although about 40% of their alumni hold academic posts of some kind (mostly part time in clinical departments) a minority of fellows seek the master's or doctor's degree in laboratory fields preparatory to careers limited to laboratory investigation and teaching.

It has always been the philosophy of the Mayo Foundation that residents in clinical fields should supplement a complete well-rounded practical residency training with laboratory experience including research. Practically all



residents avail themselves of this opportunity. It is the writer's conviction that some laboratory research training is of considerable value to the clinician, even if he may never again carry out laboratory investigation. This thesis may be expounded as follows.

Past research experience by a physician now entirely engaged in clinical practice sharpens his judgment and enhances his evaluation of reports in the medical literature. Experience in research warns against inadequacy of numbers of observations, faulty controls, inaccurate measurements, intrusions of chance, and the inherent variability of life processes; it sensitizes the physician to incomplete evidence, increases his wariness of exaggerated claims, tempers his acceptance of enthusiastic predictions.

Research reveals the painful difficulty of discovery. Nature guards her secrets jealously and is loath to reveal them. A long and labored span of three decades elapsed between the experimental production of diabetes in dogs and the beginning of its control in man. All physicians are somewhat aware of the difficulty of discovery. A full awareness comes only to the physician who has himself carried out scientific investigation.

Even though a physician may do no research or engage in a limited specialty such as cardiology, a past research experience may provide a rewarding hobby or special interest to be followed at least in the literature and perhaps also at scientific meetings. The resident who spends only 3 to 6 months in a cardiac-catheterization laboratory might be prompted to follow subsequent findings in this field with considerable gratification. He will observe with special appreciation the latest developments in artificial blood circulation, extracorporeal aeration of blood, refrigeration, control of cardiac arrest, electrical pacemakers, intracardiac prostheses, repair of valves and septal defects—the many discoveries to come in the control of congenital and acquired cardiac disease.

Research develops an alertness to the apparently inconsequential. In carrying out any research project, it soon becomes clear that it is essential to be forever on the alert for an unexpected observation sometimes seeming almost to be an accidental occurrence. A celebrated example is the "accidental" discovery of penicillin by Fleming. Clinicians who rise above the ordinary have perhaps, in many instances, through research experience similarly become allergic to the minute, the obscure, the superficially incongruent.

Research provides lessons in teamwork. Little modern research of consequence is carried on by the lone investigator. More commonly in evidence is the combined effort of experts in several disciplines. Studies on poliomyelitis vaccine necessitate collaboration between bacteriologist, neurologist, internist, statistician, epidemiologist, biochemist, pathologist, and others as well. Whoever does not learn (perhaps in an experimental laboratory) this lesson of team work in the practice of medicine and the employment of consultations by a collaborating group will be much less than a good physician.

Research engenders a respect for persistent routine. The investigator patiently repeats the experiment again and again, week upon week, changing

the procedure, perfecting the technic, analyzing the failures, month after month doggedly pursuing the goal with no assurance of reaching it. There is an abundance of routine and boredom demanding inordinate tenacity to continue the venture. Everyone, no matter how importantly he contributes to the world's work, must learn this lesson of persistence in routine. The rewards of research or of medical practice demand countless inglorious hours of stubborn work as routine as might be found in the performance of many a less pretentious task than medicine.

Research also fosters a healthy skepticism of one's own conclusions, a familiarity with the scientific method, a concise formulation of a problem and its solution, all of which are invaluable ingredients of good clinical practice.

Finally, research provides knowledge and familiarity with one of the highways of discovery. The study and reading essential in carrying out a research project, determining what has gone before in this area, and what yet needs to be done are as different from the more casual reading of such material as actually traveling a countryside is different from reading a highway map. The gratification of such an excursion is intensified by the ultimate arrival at the end of the charted road where exploration into the unknown occurs. Discovery, great or small, of what was never known before is an adventure to be cherished, an experience likely to color a physician's entire outlook on his work. The physician who is imbued with the spirit of investigation, augmented by research experience, will be a little more persistent in his diagnostic searchings, in his therapeutic efforts, or in his self-evaluation.

(Editor's Note: Dr. Johnson's astute observations and the outstanding clarity with which he presents them are noteworthy. Teachers of all medical and surgical clinical specialties and their residents, as well as all interns, would do well to heed the factual concepts which are so pointedly laid down.)

\* \* \* \* \*

#### Narcolepsy - Condition Misdiagnosed as Hypothyroidism

E. C. Bartels MD, Dept of Internal Medicine, and S. B. Bronstein MD, former Fellow in Internal Medicine, The Lahey Clinic, Boston, Mass.  
Lahey Clinic Bulletin 12: 113-118, April - June 1961.

Physicians interested in thyroid disease frequently see patients who because of their symptoms are erroneously suspected of having hypothyroidism. These patients have taken thyroid medication, some for years, on the assumption that they are thyroid deficient, and finally seek advice regarding continuing therapy, usually because the symptoms have not been relieved. Should it be concluded that the patient has a normally functioning thyroid, it is the consultant's responsibility to decide the basis for the symptoms which initially led to the assumption that the patient had hypothyroidism. Obesity is thought by patients and occasionally by physicians to be the result of thyroid insufficiency



in spite of clinical experience that obesity is not a manifestation of hypothyroidism. Hypothyroidism may account for an accumulation of 8 to 10 pounds of edema fluid which is rapidly lost when a physiologic dosage of thyroid is given. Clinical experience with profound myxedema and overweight indicates that a strict reduction diet in addition to thyroid medication is necessary to produce loss of weight in these patients.

Fatigue or tiredness is the second most common symptom thought to be the result of reduced thyroid function. It is true that one of the major complaints of hypothyroidism is loss of energy and a sense of slowness. However, when this symptom stands alone, is worse in the morning, and is fluctuant over a long period of time, and when objective signs of hypothyroidism are absent, the diagnosis usually is chronic nervous fatigue.

In eliciting a careful history from a patient with undue fatigue who is suspected of being hypothyroid, the physician may find that the symptoms are misinterpreted. What is meant by fatigue and tiredness may be revealed to be drowsiness, and it was for this complaint that thyroid was given. The drowsiness is usually apparent to members of the patient's family and friends, but often dismissed as a manifestation of lack of interest, mental dullness, or sheer laziness.

One of the authors (E. C. B.) became interested in this problem because not infrequently he saw patients suspected of having hypothyroidism who had narcolepsy. To investigate this problem the authors reviewed all Lahey Clinic cases between 1948 and 1958 in which a diagnosis of narcolepsy was made. Of 109 cases coded as narcolepsy or possible narcolepsy, 12 were eliminated because the diagnosis was not sufficiently well established. Of the 97 patients with narcolepsy, a diagnosis of hypothyroidism had previously been made in 14%, and they had been taking thyroid medication. Thirteen were euthyroid, and one had both hypothyroidism and narcolepsy.

## Results

In 1959 and 1960, six additional patients with narcolepsy were referred because of possible hypothyroidism, thus making a total of 20 cases available for study. The results of the study of these 20 cases revealed that narcolepsy had not previously been considered in a single case, although one patient did report benefit from dexedrine. Sixteen patients were women and 4 were men. Their ages ranged from 20 to 59 years; 10 were in their early twenties. In the younger age group, the problem had become acute in college or when they attempted to work. Six patients were obese, a factor which suggests the diagnosis of low thyroid function, and 14 were of normal weight. The duration of the symptom of "fatigue or tiredness" ranged from one to 20 years and averaged 7 years, evidencing a serious delay in making a correct diagnosis. Hypothyroidism was usually suspected because of the symptoms. Thyroid function studies had been undertaken in only 6 patients, and the basal metabolic rate ranged between  $-12$  and  $-23$ . In one patient, a protein-bound iodine value of 3.1 micrograms was considered evidence of hypothyroidism.

Dessicated thyroid, from 60 to 480 mg a day, Cytomel up to 75 micrograms a day, and Proloid were the agents given over an average of 3 years, ranging from 2 months to 14 years. Thyroid medication was discontinued in all but one patient, and all 19 remained euthyroid. Analeptic medication, benzedrine or dexedrine, completely relieved the symptoms of all patients. Their course has now been followed for over 6 months. Two patients have had remissions, in one after 3 years of therapy. The dosage of benzedrine or dexedrine required for control varied from 15 to 35 mg for the former and 15 to 30 mg for the latter. The readiness with which control was obtained in these 20 patients leads to the conclusion that they have mild narcolepsy.

### Discussion

Narcolepsy in its various forms is not a rare entity. The diagnosis is readily made in patients who have pronounced symptoms. In some, the history is not readily interpreted because of mildness of symptoms and failure of physician alertness. In less clearly defined cases, the patient may mistake symptoms of irresistible drowsiness for chronic fatigue.

The "narcolepsy syndrome" referred to by Ganado (1) includes a variety of phenomena such as: (1) Narcolepsy—a condition which varies from the extreme of irresistible bouts of sleep to sustained drowsiness without episodes of actual sleep. The patients in the latter group report merely a recurring irresistible drowsiness and an awareness of not being alert or entirely conscious of surroundings. (2) Cataplexy—a condition of sudden decrease or loss of muscle tone, usually in the legs, characteristically precipitated by a strong emotion such as fright, anger, or laughter. (3) Sleep Paralysis—a loss of power in the legs noted on falling asleep or on awakening. (4) Hallucinations during sleep.

Narcolepsy occurs alone in only 25% of patients with the narcoleptic syndrome, and narcolepsy with cataplexy in about 68%. The diagnosis of narcolepsy can be made by procuring a distinctive clinical history and obtaining confirmation by clinical improvement after administration of an analeptic drug. No laboratory test is diagnostic. In this day of a trend in medicine toward diagnosis by technical methods, a disease which is diagnosed only by time-consuming history taking may readily be overlooked.

The error of diagnosing narcolepsy as hypothyroidism is alluded to in a recent editorial by Yoss and Daly (2). In their series, hypothyroidism was the most common incorrect diagnosis, this error being the result of failure to analyze the patient's complaint of tiredness and lack of "pep" when actually the patient used these words to describe sleepiness. They also reported that their patients had no clinical or laboratory evidence of hypothyroidism and that the administration of thyroid extract did not relieve abnormal drowsiness.

### Summary

A study of patients with narcolepsy indicated that in 14% of cases hypothyroidism was suspected and treatment instituted before the correct diagnosis was



established. Twenty such misdiagnosed cases were studied. A careful analysis of the complaint, usually given as tiredness, made the proper diagnosis possible. These patients had symptoms for an average of 7 years and had been receiving thyroid medication for a period of 3 years. All responded to analeptic therapy. Physicians interested in thyroid disease must continue to search for additional cases which fall into this category.

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\* \* \* \* \*

#### T. Cruzi Isolated from Opossums and Kissing Bugs - Alabama

Reported by W.H.Y. Smith MD, Director, Bureau of Preventable Diseases, Alabama Dept of Public Health, and K.L. Hays, Associate Professor of Zoology, Auburn University School of Agriculture: Morbidity and Mortality Weekly Report, Comm Dis Center, PHS DHEW, Atlanta 22, Ga., November 17, 1961.

*Trypanosoma cruzi*, the etiologic agent of Chagas' disease (Brazilian or American trypanosomiasis) has been isolated from native opossums collected in Lee and Barbour Counties in Alabama. Infected kissing bugs, *Triatoma sanguisuga*, have also been recovered from animal dens in the Barbour County area. It is believed that this isolation represents the first recovery of the organism from Alabama mammals and the first collection of infected bugs from East of the Mississippi River. Studies are now proceeding at Auburn University concerning the virulence of these strains for laboratory and native mammals.

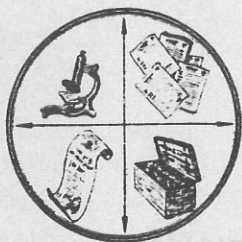
Editor's Note: Animals infected with *Trypanosoma cruzi* have been found in Arizona, California, New Mexico, Texas, Louisiana, Georgia, Florida, and Maryland. The heaviest infections have been found in wood rats, opossums, skunks, and armadillos. Infected *Triatoma* have been found in Arizona, California, New Mexico, and Texas. Only two incidents of indigenous human infection have been etiologically diagnosed. Both of these cases occurred in South Texas. More recently, antibody studies carried out on a group of 500 indigents in the vicinity of Corpus Christi, Texas have revealed that 9 of the 500 individuals tested had significant elevations of complement fixing antibody to *T. cruzi*.

Children, especially infants under 2 years of age, are particularly susceptible to the disease. The disease is transmitted from infected mammals to kissing bugs and then to man. The acute stage lasting several weeks may be characterized by any of the following: fever, malaise, irritability, edema of face, eyelids, or legs, enlargement of spleen and liver, myocardial damage, or encephalitis. Other early signs are inflammation and swelling of the

lachrymal glands, conjunctivitis, local reaction at the site of a bite, and regional lymphadenopathy. Many infected persons, especially adults, have few or no clinical manifestations.

It is not unlikely in rural areas of the South and Southwest that some of the nonspecific illnesses, conjunctivitis, idiopathic myocarditis, and encephalitis may be caused by *T. cruzi* infection.

\* \* \* \* \*



## MISCELLANY

### ARMY COMMENDATION MEDAL

The Secretary of the Army has awarded the Army Commendation Medal to LT James E. Kemp, MSC, U.S. Navy. The citation reads:

LT JAMES E. KEMP, United States Navy, distinguished himself by exceptionally meritorious service from September 1959 to June 1961. During this period he served with distinction as Chief of the Engineering Division, Medical Equipment Development Laboratory, Fort Totten, New York. He ably demonstrated an intimate knowledge of the fiscal and administrative aspects of the engineering development, and inaugurated innovations for improvement. Foremost of his many achievements was the reorganization of the internal cost accounting system into a more accurate, simple, and efficient manner of operation. His high degree of administrative ability was thoroughly manifested by the manner in which he pursued his objective and the results of his conscientious endeavor effected more comprehensive and specific policies which were exceedingly beneficial to the smooth and orderly functions of the Medical Equipment Development Laboratory. LT KEMP's initiative, perseverance, and unvacillating devotion to duty have been worthy of emulation. His outstanding performance of duty throughout this period has been in keeping with the finest traditions of the military service and reflects the highest credit upon himself and the military establishment.

\* \* \* \* \*



International Notes - Quarantine Measures

Morbidity and Mortality Weekly Report, Comm Dis Center, PHS DHEW, Atlanta 22, Ga., November 17, 1961.

The 1961 edition of the booklet "Immunization Information for International Travel" is available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. It has 84 pages and is priced at 25¢ a copy with a 25% discount on one hundred copies or more delivered to the same address.

The principal additions and changes since the last edition include:

(1) The addition of poliomyelitis as one of the immunizations recommended for all international travel; (2) The most recent information on immunization requirements for entrance into countries; (3) Additional yellow fever vaccination centers in the U. S. ; (4) The deletion of Arizona, New Mexico, Oklahoma, North Carolina, and part of West Texas from the yellow fever receptive areas of the United States.

Three changes should be made in the 1961 booklet "Immunization Information for International Travel," PHS Publication No. 384.

1. Africa

Congo (Brazzaville), page 23

Smallpox vaccination - 6 months of age and over

Cholera vaccination - arrivals from infected areas, one year of age and over

All other information remains the same.

2. Oceania

Ryukyu Islands, page 60

(Okinawa)

Cholera vaccination - arrivals from infected areas, 6 months of age

Yellow fever vaccination - arrivals from infected areas, 6 months of age and over

All other information remains the same.

3. Designated Yellow Fever Vaccination Centers

The following name should be added to the list of Yellow Fever Vaccination Centers in Section 6, p. 69:

<u>City</u>	<u>Center</u>	<u>Clinic Hours</u>	<u>Fee</u>
Texas (Amarillo)	Amarillo Bi-City- County Health Unit 417 Austin Street Tel: DR 2-6562	2nd and 4th Wednesdays, 1:00 - 3:00 p. m.	Yes

Nicotinic Acid Poisoning - Pennsylvania

Reported by Milton Werrin V.M.D., Chief, Veterinary Public Health Section, Philadelphia Dept of Public Health: Morbidity and Mortality Weekly Report, Comm Dis Center, PHS DHEW, Atlanta 22, Ga., October 27, 1961.

Two cases of nicotinic acid (niacin) poisoning involving 5 persons were recently investigated in Philadelphia, Pa. In both instances ground meats including beef and lamb were the foods implicated. Symptoms exhibited by all 5 persons were essentially the same—intense flushing of the skin, a feeling of warmth, itching, and some abdominal discomfort. The ill effects lasted from 45 minutes to an hour. Onset of symptoms occurred within 15 minutes following the ingestion of the meat. All affected individuals ate the ground meats twice, and on both occasions became ill with the same syndrome. Samples of meat obtained at the home of the patients and the market where meats were purchased revealed niacin to be present in the following amounts:

Chopped lamb patties	87 mg/100 grams of meat
Ground beef patties	112 mg/100 grams of meat
Ground beef stuffed into peppers	50 mg/100 grams of meat
Ground beef	145 mg/100 grams of meat

The niacin had been added to the meat to assure retention of its color for longer periods of time, thereby increasing its shelf life. It is felt by the Philadelphia officials that the addition of niacin to ground meats is more universal than is generally suspected.

\* \* \* \* \*

BUMED INSTRUCTION 6270.3A

22 November 1961

Subj: Threshold limit values for toxic materials

Encl: (1) Threshold Limit Values

Purpose. To establish as a basic reference the threshold limit values of toxic materials adopted by the American Conference of Governmental Industrial Hygienists, and reprinted as enclosure (1) with their permission.

Definition. The term "threshold limit values" as used herein is intended to indicate the maximum average atmospheric concentrations of contaminants to which personnel may be exposed during an 8-hour workday, over a prolonged period of time, without adversely affecting their health. The threshold limit values should be used as a guide in the control of health hazards and should not be regarded as fine lines between safe and dangerous concentrations. The most desirable levels in all cases are those approaching zero, but practical considerations frequently require the acceptance of higher levels which are safe but not ideal.



Electric Activity of Gastroduodenal Junction

Paul Bass, Charles F. Code, and Edward H. Lambert, Section of Physiology, Mayo Clinic and Mayo Foundation, Rochester, Minn. Amer J Physiol 201: 587, October 1961.

In preparation for a study of the electric activity in the wall of the gastroduodenal junction in unanesthetized trained dogs, the pyloric portion of the stomach (antrum), the pylorus, and the first portion of the duodenum were exteriorized surgically.

When the animals were fully recovered, needle electrodes were inserted into the wall of the bowel for the detection of electric activity. The pylorus was found to act as an "electric insulator" between the stomach and the duodenum. The basic electric rhythm (BER) and the fast, or spike, activity detected in both the pyloric canal and the duodenal bulb became attenuated in the pylorus and usually disappeared in it. The BER of the antrum had a mean frequency of 4.4 cycle/min and spike potentials sometimes were associated with it. The frequency of the BER in the duodenal bulb was the same as in the duodenum, but its voltage was less and its form more irregular. Spike potentials in the bulb occurred during a greater portion of the BER and had a greater tendency to distort the BER than in the more distal duodenum.

(This investigation was supported in part by Research Grant A-2015 from the Institute of Arthritis and Metabolic Diseases.)

\* \* \* \* \*

Naval Medical Research Reports

U.S. Naval School of Aviation Medicine, Aviation Medical Center, Pensacola, Fla.

1. Visual Perception of the Horizontal During Prolonged Exposure to Radial Acceleration on a Centrifuge. MR 005.13-6001 Subtask 1 Report No. 54, 18 August 1960.
2. Factor Analysis of Cadet Peer Ratings. MR 005.13-3003 Subtask 10 Report No. 5, 19 October 1960.
3. Observations on the Pneumotachocardiogram. MR 005.13-7004 Subtask 7 Report No. 1, 16 December 1960.
4. Maximum Breathing Capacity Prediction from the Velocity-Volume Loop. MR 005.13-3100 Subtask 8 Report No. 2, 3 January 1961.
5. Subclinical Respiratory Disease and Altitude Tolerance in the Rat. MR 005.15-2001 Subtask 3 Report No. 4, 3 January 1961.
6. Note on the RBE of Proton Radiation in Space. MR 005.13-1002 Subtask 1 Report No. 18, 10 January 1961.
7. Antecedent Visual Frame of Reference as a Contributing Factor in the Perception of the Oculogravic Illusion. MR 005.13-6001 Subtask 1 Report No. 54, 8 February 1961.

U.S. Naval School of Aviation Medicine, Pensacola, Fla. (continued)

8. Aerometeorism: A Follow-Up Report. MR 005.13-3001 Subtask 5 Report No. 2, 16 January 1961.
9. Oxygen Contaminants: Cylinder Odors. MR 005.13-3100 Subtask 7 Report No. 3, 23 January 1961.
10. BIBLIOGRAPHY: Psychological Research in the U.S. Naval School of Aviation Medicine, July 1950 - June 1960, 6 February 1961.
11. Electroencephalographic Findings in Relation to Episodes of Altered Consciousness in Aviators. MR 005.13-3001 Subtask 1 Report No. 3, 14 February 1961.
12. Evaluation of Two Forced-Choice Formats. MR 005.13-5001 Subtask 2 Report No. 10, 15 February 1961.
13. Pulmonary Function Evaluation in Air and Space Flight. MR 005.13-3100 Subtask 8 Report No. 3, 23 February 1961.
14. Application of the System Transfer Function Concept to a Mathematical Description of the Labyrinth: I. Steady-State Nystagmus Response to Semicircular Canal Stimulation by Angular Acceleration. MR 005.13-6001 Subtask 1 Report No. 57, 10 March 1961.
15. Study of the Effects of Gunfire and Other Infantry Combat Training Noises on the Hearing Acuity of U.S. Marine Corps Recruits. MR 005.13-2005 Subtask 1 Report No. 10, 2 May 1961.
16. Effects of Varying Mode of Signal Presentation on Hearing Thresholds Obtained with Békésy-Type Audiometer. MR 005.13-2005 Subtask 1 Report No. 9, 10 July 1961.

U.S. Naval Radiological Defense Laboratory, San Francisco 24, Calif.

1. Inhibition of Bowel Epithelium Regeneration by Grafted Homologous Spleen Cells in Irradiated Mice. USNRDL-TR-479, November 1960.
2. Hypocaloric Feeding and Radiation Tolerance. USNRDL-TR-482, November 1960.
3. A Dialyzable Factor in Heated Plasma Which Sustains Rat Peripheral Blood Cultures in Vitro. USNRDL-TR-486, December 1960.
4. Liver Cell Proliferation in X-Irradiated Rats After Single and Repetitive Partial Hepatectomy. USNRDL-TR-489, December 1960.
5. Current Literature Survey of Biological Interest. USNRDL-R&L-107, December 1960.
6. Fallout and Livestock: Some Observations on the Situation as it Appears Today. USNRDL-R&L-109, January 1961.
7. Preliminary Evaluation of Radiological Hazards Associated with Operation of Nuclear-Powered Devices at Pacific Missile Range. Part I. Radiation Protection Guidance, Rad-Safe Requirements, and Pertinent NMFA Environmental Factors. USNRDL-TR-497, (OUO) February 1961.
8. Current Literature Survey of Biological Interest. USNRDL-R&L-111, February 1961.
9. Specific Homograft Tolerance in Lymphoid Cells of Long-Lived Radiation Chimeras. USNRDL-TR-499, March 1961.



From the Note Book

Admiral Kenney Speaks at University of Pittsburgh. The Surgeon General of the Navy, Rear Admiral Edward C. Kenney MC USN, gave an address, "Progress in Naval Medicine," at the Annual Scientific Day of the University of Pittsburgh School of Medicine, 17 November 1961. Captain W. Scott Nettrour was Chairman of the Program Committee. In his remarks, Admiral Kenney outlined the Navy Medical Department's support to fleet and shore activities as well as the organization of U.S. Naval Hospitals. In addition, he commented on the education and training program of the Medical Department, and how it is specifically designed to meet the Navy's anticipated requirements for an adequate number of trained Medical officers not only in the various clinical specialties but also in each of the military medical specialties. He spoke of the advances that have been made in submarine medicine, amphibious and Marine Corps field medicine, aviation medicine, nuclear medicine, aerospace medicine, and the Medical Department's research program.

Admiral Kenney said: "While much of our medical practice, particularly in the larger hospitals, is identical with that in large civilian medical centers, there is a host of special problems related to operational situations peculiar to the modern Navy and Marine Corps." He concluded his address with a film on Aerospace Medicine.

On the preceding day Admiral Kenney attended the dinner meeting of the Naval Reserve Specialist Unit (Medical) 4-1 and the Naval Reserve Hospital Corps Division 4-2 of Pittsburgh, Pa. (TIO, BuMed)

Cover Art Work. Appreciation is extended for this year's art work on the cover of the Christmas issue of the News Letter which was performed by David A. Culbertson HM2 USN. This dedicated and capable artist is with the Medical Illustration Division of the Administrative Department, U.S. Naval Medical School, NNMC, Bethesda, Md. Culbertson is the chief Instructor in the course in Medical Illustration Technic of the Naval Medical School.

Seabees to Build Atomic Plant at McMurdo Sound, Antarctica. The 1st Mobile Construction Battalion will complete Antarctica's first nuclear power plant by March 1962. This achievement will end the need for much of the diesel fuel now required to provide heat, light, and electrical power at McMurdo. Other construction projects include an aviation electronics repair shop on the site of a building destroyed by fire last year, a balloon inflation shelter, a cosmic ray laboratory, and two 250,000 gallon fuel storage rooms. (NavNews, 1 Nov '61)

"Sixty Years of Destroyers" Planned. The Navy is planning to celebrate the sixtieth Anniversary of Destroyers next year in conjunction with the commissioning of the world's first nuclear-powered destroyer, USS BAINBRIDGE (DLGN-25). Commissioning of BAINBRIDGE is scheduled for 31 August 1962. This will be almost 60 years from the commissioning of destroyer number 1, the second ship to bear the name BAINBRIDGE. This first destroyer was placed in reserve commission on 24 November 1902. (NavNews, 1 Dec 1961)

**RESERVE****SECTION**USNR Retirement Worries?Check Over These Points

(continued from issue of 1 December 1961)

**How Do You Prorate Points?**

The 50-point requirement for a year's satisfactory federal service may be prorated for a partial year and the 15 gratuitous points are similarly prorated. To prorate, however, the status of the member must change at the end of the period to be prorated. Change of status means resignation, discharge, or transfer to the Inactive Status List or Retired Reserve.

As an example, assume a Reservist has 19 years and 8 months of satisfactory federal service on 30 June 1959. In order to complete 20 years, he needs 4 months' additional service. To credit these 4 months, he must have 17 retirement points ( $4/12$  times 50). He is given 5 gratuitous points ( $4/12$  times 15), so he must earn 12 points from 1 July to 1 November and request transfer to the ISL or Retired Reserve, or otherwise be severed, effective 1 November. For each additional month beyond 1 November, he must earn  $1/12$  times 50 points in order for the service of any part to be creditable.

**How To Check Your Retirement Credits**

If you are a Reserve officer, you may obtain a statement of your satisfactory federal service (no more than once a year) by addressing a request directly to: Officer-in-Charge, U. S. Naval Reserve Officers Recording Activity, 30th and Fort Streets, Omaha 11, Nebraska.

If you are an enlisted Reservist, you may obtain information regarding your satisfactory federal service from the commanding officer of the unit to which you are attached, from the Commandant of the Naval District holding your service records, or from the Chief of Naval Personnel (Pers E3).

**How To Compute Retired Pay**

The rate of retired pay is the number of accrued retirement points divided by 360 and multiplied by two and one-half percent times the applicable base pay of the rank or rate in which retired. Maximum is 75% of basic pay.

Points for retirement pay purposes are credited to Reservists as follows: Through 30 June 1949, 50 points are given for each 365 days of



inactive duty; After 30 June 1949, points earned as indicated in the preceding paragraphs are credited to a maximum of 60 points each year; and one point is credited for each day of active duty and active duty for training, including travel time.

The official method by which retired pay is computed is as follows:

- (1) Add the number of retirement points earned. Divide this total by 360. Carry the resultant figure to three decimal places, and then round it off to two decimal places. Example: 4735 (points) divided by 360 = 13.15.
- (2) Multiply the result of the first step by two and one-half percent (.025). Carry the resultant figure to five decimal places, and then round it off to four decimal places. Example:  $13.15 \times .025 = .32875$  or .3288.
- (3) Multiply the result of step two by monthly basic pay. Carry the resultant figure to three decimal places and then round it off to two decimal places. Example: Pay grade 0-5 (over 22 years),  $\$775.00 \times .3288 = \$254.82$

(Note: For rounding-off purposes, when the last digit is five or greater, the preceding digit will be increased to the next higher number; if the last digit is less than five, it will be disregarded.)

Pay will be based upon the highest permanent or temporary rank or rate in which service was satisfactory, as determined by the Secretary of the Navy.

Retired pay begins on the effective date of retirement. This may be the first of the month after the date of reaching age 60, or the first day of the month after completion of the service requirements, whichever is later.

### What About Other Income?

Naval Reservists receiving retirement pay under this law are exempt from the dual employment statute (5 U. S. C. 58 and 62) and the dual compensation statute (5 U. S. C. 59a).

Social Security and Civil Service retirement pay benefits may be received concurrently with Naval Reserve retirement pay.

Neither pension nor disability compensation benefits from the Veterans Administration, nor compensation under the provisions of the Federal Employees' Compensation Act, as amended, may be received concurrently with retired pay. However, a member or former member may waive his retired pay in order to receive VA compensation or pension in lieu of retired pay, and may later elect to receive retired pay in lieu of VA compensation or pension.

### What If You Complete Your "20" Before Reaching Age 60?

You have 4 possible alternatives which may be followed if you complete 20 years of satisfactory federal service before you reach age 60:

Continue Active Membership. In this manner, you may increase the amount of your retirement pay by earning additional points as well as by adding additional years of service which increase the basic pay upon which your retirement pay is based.

Request transfer to the Inactive Status List. In this status, you may not earn additional retirement points. However, ISL time does count for periodic basic pay increases. Basic pay is increased by additional years of service up to 22 for Commanders and 26 for Captains.

Request transfer to the Retired Reserve. Except while serving on active duty, no additional points nor years of satisfactory service may be accrued in this status. However, you would remain a member of the Naval Reserve in an honorary capacity and thus be eligible for certain other benefits including longevity credit for basic pay purposes.

If you are transferred to the Retired Reserve, you are entitled to wear your uniform on appropriate occasions (for example, official ceremonies in which military personnel are taking part) and you may use your title (rank) in connection with commercial enterprises. In time of war or national emergency declared by Congress, or when otherwise authorized by law, members of the Retired Reserve may be ordered to active duty without their consent only when the Secretary of the Navy, with approval of the Secretary of Defense, determines that an adequate number of members of Reserve components in an active status are not readily available. Members of the Retired Reserve are required to keep the Chief of Naval Personnel and the Commandant of their Naval District informed of any change of address.

For additional information on transfer to the Retired Reserve without pay, see BUPERS Instruction 1820.2A.

Resign or be discharged. In this instance, you would resume civilian status completely. You would be eligible only for retired pay (provided you have satisfied the basic requirements) in the nature of a pension when you reach age 60, and you would not be placed upon the Retired List. You would not be eligible for any other benefits; similarly, you would not be subject to orders to active duty.

### Privileges of Reservists Retired With Pay

Many service-connected privileges are accorded Reservists retired with pay. When not on active duty, they may wear the prescribed uniform of the rank or rate held on the Retired List, when the wearing of the uniform is appropriate. They are allowed to use their military titles in connection with commercial enterprises. They may be accorded the privileges of Navy Exchanges, small stores, officers' clubs, enlisted clubs, armed services exchanges and commissary stores—subject to the availability of facilities.

Members and former members who have served a minimum of eight years of active duty (not including active duty for training) and their dependents are entitled to medical care. Information on medical care for retired Reservists and their dependents is contained in the Manual of the Medical Department, Chapter 21, and BUPERS Instruction 1750.5A.

Retired personnel and their accompanying dependents may take one round trip per year—on a space-available basis—on an MSTS ship, subject to payment of the applicable MSTS charges for space-available travel. Retired



Reservists and their accompanying dependents may also travel via MATS on a standby, space-available basis.

### Obligations of Reservists Retired With Pay

In addition to their many rights and privileges, retired Reservists also have certain obligations. They are, of course, subject to the regulations of the Secretary of the Navy. They may be ordered to active duty in time of war or national emergency at the discretion of SecNav, but may be ordered to active duty in peacetime only with their consent.

They are prohibited from wearing the uniform in connection with non-military, personal, or civilian enterprises, or activities of a business nature. Retired personnel in an inactive duty status in a foreign country may not wear the uniform except when attending, by formal invitation, ceremonies or social functions at which the wearing of the uniform is required by the terms of the invitation or by the regulations or customs of the country involved.

All retired personnel are required to report changes of address to the Commandant of the Naval District in which they reside. They must keep the Commanding Officer, U. S. Navy Finance Center (Special Payments Division), Cleveland 14, Ohio, informed of any change in mailing address.

### Voluntary Retirement of Officers After 20 Years' Active Duty

Title 10, U. S. Code, section 6323 (formerly Public Law 305, 79th Congress), provides that a Reserve officer who has completed 20 years' full time active duty (including active duty for training) in the Navy, Marine Corps, Coast Guard, Army, Air Force, or their Reserve components, at least 10 years of which must be active commissioned service, may—upon application—be placed on the Retired List.

Retirement pay will be computed at two and one-half percent of basic pay at time of retirement, multiplied by:

Total number of years of service creditable for basic pay purposes, if on active duty continuously from 1 June 1958 to date of retirement (a part of a year of six months or more is creditable as a whole year); or if the member did not serve on active duty continuously from 1 June 1958 to date of retirement, multiplier will be a number equal to the total number of years of service creditable for basic pay purposes as of 31 May 1958, plus the years of service credited to him after that date. (A part of a year of six months or more is creditable as a whole year.)

The pay computation is made as follows: Credit one day for each retirement point earned after 31 May 1958 and divide by 360. This is an example: Assume the Reservist's pay entry base date is 15 September 1940. As of 31 May 1958, he would be credited with 17 years, 8 months and 16 days. Between 31 May 1958 and his date of retirement he earned a total of 1086 retirement points through active duty and through correspondence courses, drill attendance, AcDuTra, and so on. This total, divided by 360, equals

3 years and 6 days of service, for multiplier purposes. The Reservist would thus have a total of 20 years, 8 months and 22 days to his credit. Since his partial year is more than 6 months, he would be credited with 21 years for multiplier purposes. His retirement pay would be figured by multiplying his basic pay at time of retirement by two and one-half percent (.025) and by 21 years. (Remember, however, that the Reservist must have spent at least 20 years on full-time active duty.)

Retirement pay may not exceed 75% of basic pay.

Applications should be submitted six months before date of retirement desired.

#### Retirement After 20 or 30 Years' Active Duty

Title 10, U.S. Code, section 6327 (formerly sec. 413, Public Law 476, 82nd Congress), provides that members who have performed not less than 30 years' active duty or who have had not less than 20 years' active duty—the last 10 of which shall have been performed during the 11 years preceding their transfer to the Retired Reserve—may be placed in the Retired Reserve upon their application.

Retirement pay under this section will be computed at 50% of the applicable basic pay of the grade in which retired.

In the event a member had previously served satisfactorily, as determined by SecNav, in a higher officer grade than that held at time of retirement, he will be advanced on the Retired List to the higher grade effective on the date of his retirement. In this instance, his retirement pay will be computed as outlined above for those retiring after 20 years of active duty. Any member of the Naval Reserve who meets the requirements is eligible, except that no person who was not a member of the Naval Reserve or Marine Corps Reserve on 1 January 1953 will be eligible for the provisions of this section. This portion of the law will terminate on 1 January 1973.

Applications should be submitted 6 months before the desired date of retirement.

(continued in next issue)

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#### Announcement of Discontinuance Correspondence Course NavPers 10998-1

Medical Department Correspondence Course, "Blood Transfusion, Methods and Procedures, NavPers 10998-1" is discontinued. All personnel who are presently enrolled in NavPers 10998-1 will be allowed to complete the course.

Major revision of NavPers 10998-1 is in process of preparation.



## AVIATION MEDICINE DIVISION



### RESEARCH REPORT

#### Is it Possible to Differentiate by Inhalation Between Air and Oxygen?

Roscoe G. Bartlett, Jr. and Rita A. Hertz, U. S. Naval School of Aviation Medicine, U. S. Naval Aviation Medical Center, Pensacola, Fla.

Ever since its discovery by Joseph Priestly in 1774, oxygen has been thought by many to have curative and restorative powers. When it was first learned that life depended upon the small percentage of oxygen in our atmosphere, it was assumed immediately by many that increased percentages of oxygen would stimulate or rejuvenate. As a matter of fact, it has been only recently that we have learned of oxygen toxicity and have been impressed with the fact that too much oxygen can be as fatal as too little. Even as little as one atmosphere of oxygen can be fatal over a protracted time period, and evidence is accumulating that less than one atmosphere of oxygen may be harmful. For instance, retrolental fibroplasia has been produced in infants maintained in an incubator with supplemental oxygen. However, the life-saving effects of oxygen administration are manifestly obvious in those cases in which oxygen transfer across the alveolar membrane is impeded. In such cases the tissues are not exposed to the high oxygen tensions.

In the normal individual there are no a priori reasons why oxygen administration should be beneficial. The physical association of oxygen with hemoglobin is of such a nature that the hemoglobin is essentially completely saturated with oxygen at the oxygen tension existing in the atmosphere. This is true not only at sea level but also at all but the higher altitudes at which people live. Increasing the oxygen tension does not result in a meaningful increase in the oxygen content of the blood. And, as a matter of fact, the increased tensions of oxygen in the blood drop drastically with the release of the first small amounts of oxygen to the tissues. With oxygen administration to a normal individual, then, it appears that the tissue cells would be little affected by the increased oxygen tension in the lungs. On purely theoretical grounds, therefore, one would not expect improved performance or an increased feeling of well being to be associated with oxygen administration to the normal (healthy) individual.

In spite of this, there is a wide-spread belief that oxygen administration is beneficial in a number of ways. Many believe that it all but works

miracles in the amelioration of the aftereffects of the consumption of alcoholic beverages. On the advice of the athletic coach the athlete frequently may use oxygen inhalation at half-time in the football game, in recovery following a foot race, and in preparation for certain athletic contests. Theoretically, oxygen inhalation should be beneficial to contestants only before certain specific short contests when the ability to accumulate an oxygen debt is an important factor in determining the winner. Oxygen is advertized as alleviating fatigue and as an aid in keeping the tired driver awake. It is sold to the weary traveler on the Pennsylvania Turnpike.

Because there are no a priori reasons why oxygen administration should be beneficial under most circumstances in the normal individual, and because of the wide-spread convictions to the contrary, this investigation was undertaken. To determine finally once and for all the efficacy of the use of 100% oxygen would require considerable experimentation and involves largely psychological factors. As an initial approach to the problem experiments were designed to answer the question which, it seems, should be answered before more involved experiments are embarked upon—Is it possible to differentiate by inhalation between air and oxygen?

#### Apparatus and Procedure

Most of the subjects for this study were young, male, aviation cadets. Some had had previous oxygen breathing experience; many had not. A few of the subjects were laboratory personnel. The data from the two groups were not distinguishably different, and only the data from the 156 aviation cadets are presented.

A diagram of the experimental arrangement is shown in Figure 1. The subject could not see the cylinders of air and oxygen, the valves or the investigator. Between each trial in a test series the order of presentation of air and oxygen was changed. Even if all the three stations were not changed, all were flushed by depressing the override spring of the regulator. This flushing accomplished two purposes: First, it flushed the preceding gas (air or oxygen) from the system so that on the first breath the subject would inspire the desired test gas. Second, the flushing of all stations served to disguise the actual changes made (in order not to give any clues to the subject).

The subject used the same mask for testing at each station. All masks have a characteristic odor. With good cleaning this odor problem may be minimized; but it is still there, nevertheless. To keep this a common factor in all tests the same mask was used at each test station and by each subject. The mask was attached at the station by the usual quick disconnect fittings.

Oxygen cylinders were selected from the aviators breathing oxygen stores at the Naval Air Station, Pensacola. The compressed air was prepared at the Naval Air Station and tested by infrared analysis and was found to be free of oil and other contaminants attributable to the pumping procedure.

Using two persons who had been shown previously (1) to have high olfactory acuity we carefully selected the test cylinders of air and oxygen. It



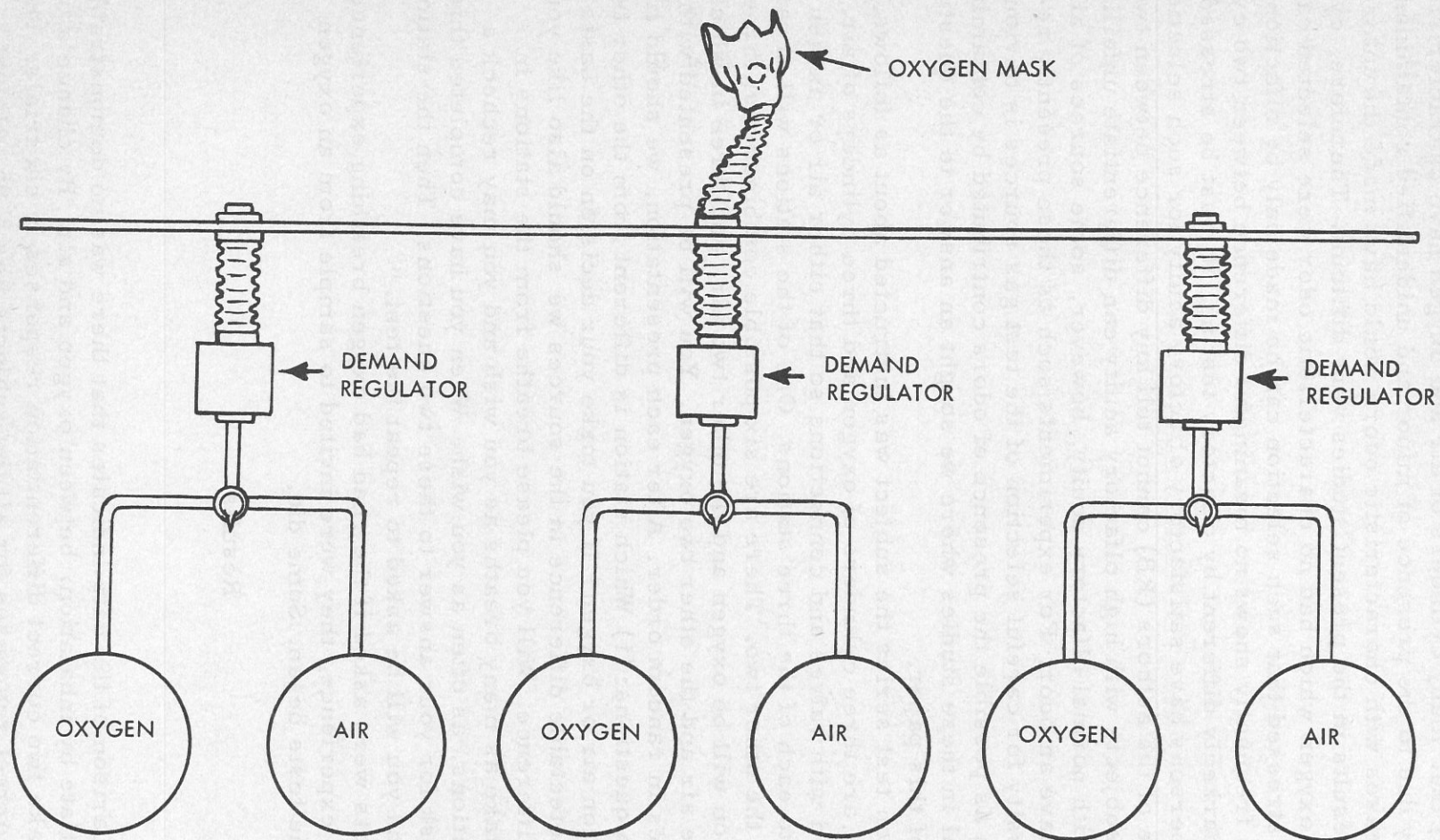


Figure 1

DIAGRAMMATIC SKETCH OF APPARATUS USED TO TEST FOR ABILITY TO DIFFERENTIATE OXYGEN FROM AIR BY INHALATION

had been found (1) that many cylinders of air and oxygen have characteristic odors, apparently due to the presence of minor and unidentified contaminants. The use of such gases with characteristic odors would have made the interpretation of the results in the present studies very difficult. Therefore, cylinders of air and oxygen which had no characteristic odor were selected carefully. It must be stressed that such selection can be made only by olfaction. Infrared analysis frequently shows no meaningful difference between two cylinders that are markedly different by olfactory testing. It must be stressed also that not all persons have satisfactory olfactory acuity for such selections. For instance, one of the authors (KB) cannot tell any difference between two sources that the subjects with high olfactory acuity can differentiate unfailingly. Even to one with normal olfactory acuity, however, some sources of air and oxygen may have an odor. For experiments such as those presently reported, the necessity for careful selection of the test gas sources is obvious. Avoiding as much as possible the presence of odors contributed by contaminants was essential in these studies where we sought an answer to the question used in the title of this paper.

Before each test series the subject was instructed about as follows. "Behind the panel are three cylinders of oxygen and three cylinders of air. They are arranged with valves and connections so that either air or oxygen can be delivered to each of the three stations. One of the stations will always be different from the other two. There are six possible combinations: three in which one station will be oxygen and the other two air, and three in which one station will be air and the other two oxygen. You will be presented with all six possibilities in random order. After each presentation, we should like you to answer two questions: (1) Which station is different from the other two? (2) Is the odd station air or oxygen? If you make your decision on the basis of some readily detectable difference in the sources we should also like you to describe this difference. Will you please breathe from the stations in order? You may take as many breaths as you wish and you may recheck a station, or all stations, as often as you wish. When you have completed this testing, we will ask for your answer to these two questions. Then the stations will be changed and you will be asked to repeat the test."

The subjects were asked if they had had oxygen breathing experience. If they had had no experience, they were invited to sample from an oxygen cylinder before the tests began. Some did.

## Results

### Differentiation

A statistical comparison of the data indicates that there was no demonstrable ability to differentiate by inhalation, between oxygen and air. By chance alone a subject could make two correct differentiation responses in six trials. The mean number of correct responses for all the subjects was 2.06, almost exactly the expected mean; so, further statistical analysis was not indicated.



Also showing that there was no statistically apparent ability to differentiate are the data shown in Figure 2. The predicted responses were almost identical with the actually measured responses. The fit is uncommonly good, and even poorer fits are compatible with a statistically insignificant deviation from the expected results on a chance basis only.

The data may be analyzed also for a deviation from the expected in another way. If one regards each station in the three-station test series as a separate test, the subject may be graded as to his performance on this one test. Viewed as such, each of the 156 subjects made 18 decisions as to the identity of the gas inhaled at each station. By use of the Student  $t$  test a value of greater than 0.5 was obtained, showing that the actual responses were not different from those expected on a chance basis only.

From the data, then, there is no statistical reason for rejecting the hypothesis that it is impossible to differentiate between oxygen and air by inhalation; thus, answering in the negative the question posed in the title.

### Designation

Since there was no demonstrable ability to differentiate between gases, a significant designation score was not expected. However, the data were analyzed, and in keeping with expectations it was found by using the Student  $t$  test that there was no observable ability to designate oxygen or air ( $P > .5$ ). This analysis, with its expected results, lends further support to the hypothesis that the subjects could not tell the difference between air and oxygen under the conditions of the experiment. The group of subjects was large enough, and the test procedure was so designed, that it is felt justifiable to extrapolate the findings from our subjects to the entire population.

The demonstration that one cannot tell the difference between air and oxygen by olfaction does not, of course, mean that continued inhalation of oxygen in certain circumstances would not have a beneficial effect on the normal person. However, these experiments do put the onus on those who advocate the use of oxygen in a variety of circumstances in which its use is not medically or physiologically indicated.

If oxygen inhalation by the athlete, tired driver, or fatigued businessman (several different companies are actually promoting and selling oxygen inhalation equipment to businessmen), cannot even be differentiated from air inhalation, as our data indicate it cannot, then one certainly would not expect that a few breaths of oxygen would have any real physiological effect. If such oxygen users actually experience beneficial effects, one would strongly suspect the involvement of psychological factors. The sale of oxygen inhalation equipment for emergency resuscitation is, of course, acceptable. However, implying beneficial effects to a normal user might seem to represent exaggerated claims for there appears to be no data relating oxygen inhalation to improved performance in the normal individual when normal levels of oxygen are available in the atmospheric air ordinarily respired. It might be argued that perhaps a small percentage of normal subjects are capable of

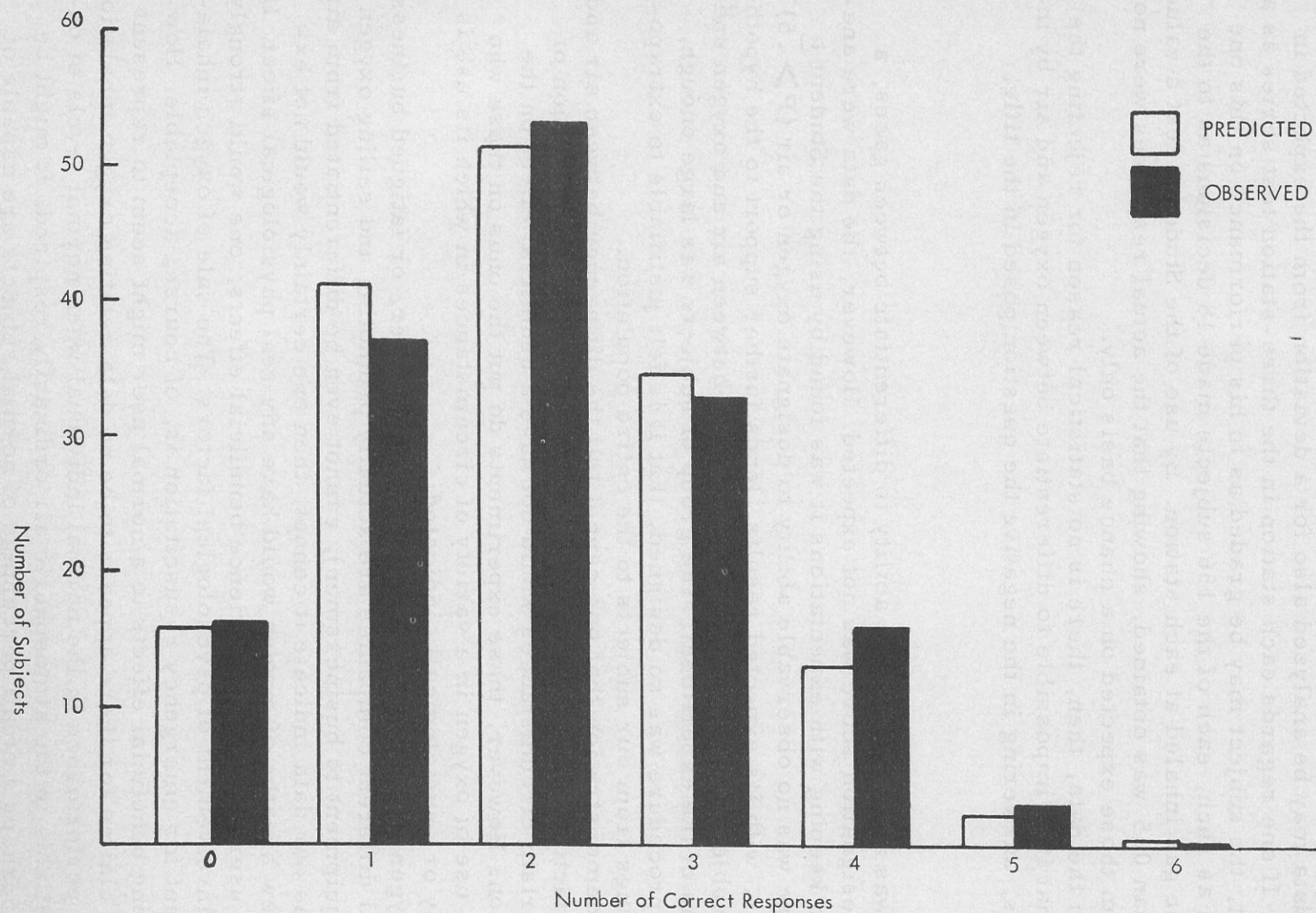


Figure 2

COMPARISON OF PREDICTED AND OBSERVED RESPONSES OF  
156 SUBJECTS ATTEMPTING TO DIFFERENTIATE OXYGEN FROM AIR BY INHALATION



differentiating oxygen from air. The data indicate that the performance was almost exactly what would be predicted on a chance basis only. Thus the data do not admit to any but a vanishingly small percentage of such gifted individuals. Furthermore, none of the subjects indicated by subjective means that they had such an ability. If some persons are found with an ability to discriminate by inhalation between oxygen and air it will be interesting to seek to determine the nature of this ability. A canvass of the likely receptors in the body that might be used in this differentiation does not indicate that such an ability should, in fact, be present in any of the population. Secondary clues through circuitous routes are, of course, a possibility.

Bureau of Medicine and Surgery Project MR005.13-3100 Subtask 5 Report No. 1, 11 July 1961.

Reference: 1. Bartlett, R.G., Jr., and Phillips, N.E., Olfactory identification of liquid oxygen contaminants. Aerospace Med., (in press), 1961.

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#### Training and Research Tools in Aviation Medicine

Robert J. Usher, Training Specialist, U.S. Naval Training Device Center, Port Washington, Long Island, New York.

The U.S. Naval Training Device Center has been assigned the task of developing an extremely high altitude, low pressure chamber to satisfy research and training requirements of the Bureau of Medicine and Surgery and the Bureau of Naval Weapons.

For 20 years, the U.S. Naval Training Device Center has supported Aviation Physiological Training and Research Programs with special equipment. During these past 2 decades, NAVTRADEVCCEN has developed over 35 types of aviation physiological trainers, survival trainers and research tools. The space chamber is the latest development and unique in its capabilities.

Space Chamber. This device is unusual in that it combines altitude, temperature, humidity, solar radiation, and rapid decompression in a single low pressure chamber (Figure 1). In the past, some small chambers have had some of these capabilities, but no single chamber has had this combination of all of them. A partial description of the space chamber and what it will accomplish is as follows:

#### Size (all inside dimensions)

Main Chamber - 9' wide x 8' high x 15' long  
Intermediate Lock - 8' wide x 7' high x 5' long  
Observer's Lock - 8' wide x 8' high x 5' long  
Parasite - 29" wide x 53" high x 56" long  
Parasite Lock - 8' wide x 8' high x 6' long

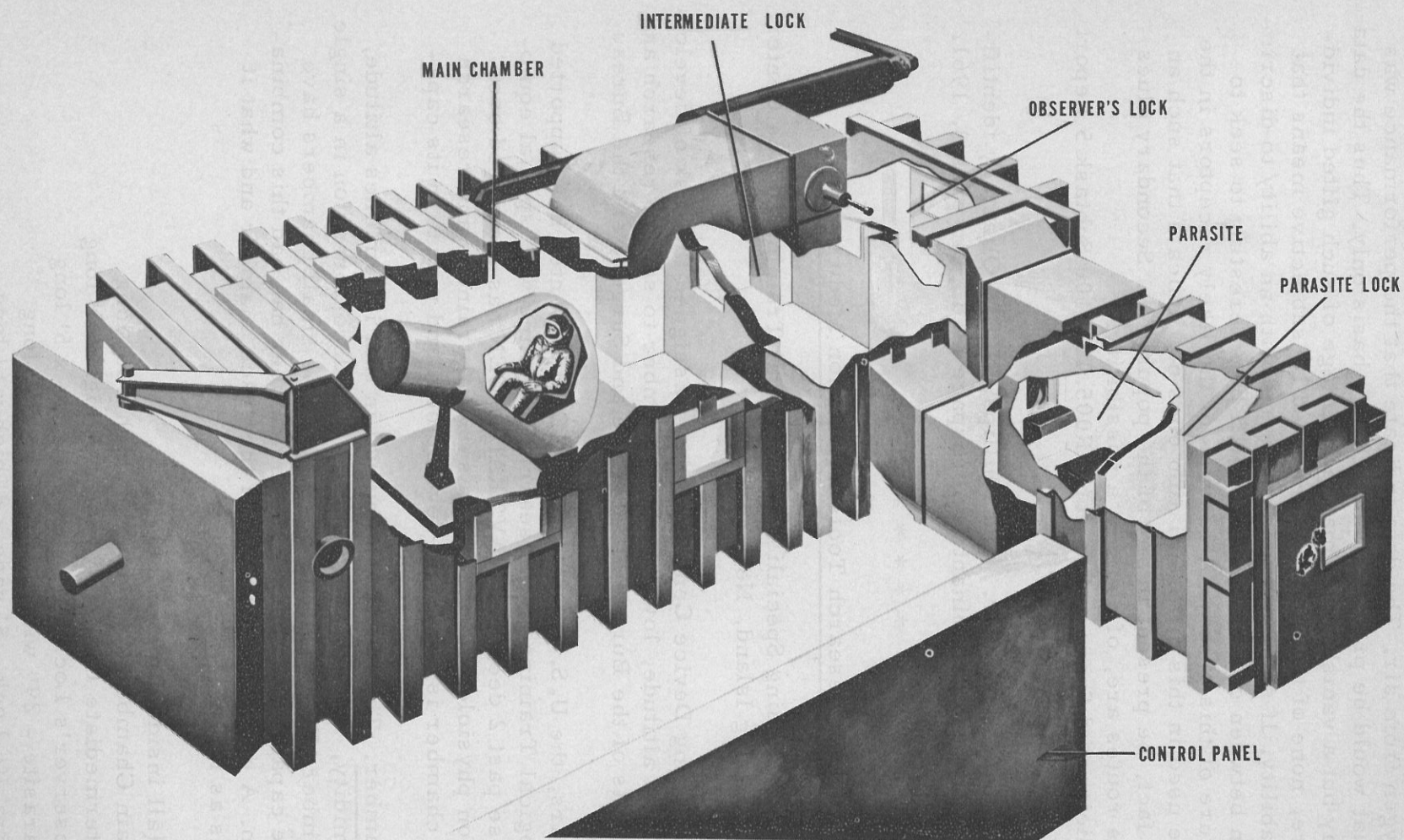


Figure 1

Device 9A12, Latest Rapid Decompression and Altitude Training Chamber with temperature, humidity, radiation and explosive decompression capabilities.



**Altitude Capabilities** - The Main Chamber will attain a simulated altitude of 250,000 feet in 30 minutes; all other compartments, (Intermediate Lock, Observer's Lock, Parasite, Parasite Lock) an altitude of 150,000 feet in 30 minutes.

**Temperature/Humidity** - All compartments except the Parasite have comfort cooling to 70° F DB and 50% RH. The Main Chamber temperature is controllable from minus 120° F to plus 450° F. The humidity is controlled from 5% to 90% RH between plus 50° F and plus 200° F.

**Solar Radiation** - The solar radiation system simulates conditions just outside the earth's atmosphere - 1400 watts/square meter measured 2' from the source with a spectrum from ultra-violet through infra-red.

**Rapid Decompression** - Rapid decompression is accomplished in the Intermediate Lock, decompressing from an altitude of 22,000 feet to 56,000 feet in 250 milliseconds. Near explosive decompression, from 22,000 feet to 85,000 feet in set times varying from 1/30th of a second to 5 seconds, is attained in the Parasite.

**Full Pressure Suit Stations** - All full pressure suit stations (9) have vent air controlled temperature from 35° F to 120° F with humidity controllable from 5% to 90% RH.

**Communication** - A three-channel communication system links the 23 inner stations, the 8 outside observers' stations and the six operator stations.

**Other Space Trainers.** In addition to low pressure chambers, the NAVTRADEV CEN has developed key training equipment presently being used in the astronaut training program. The Human Centrifuge at the Naval Air Development Center, Johnsville, Pa., is perhaps the best known of these devices. The controls and instruments of a Mercury Space Vehicle have been introduced into the centrifuge gondola and the astronauts have performed their entire mission profile in real-time and with duplicate G forces with the exception of the zero gravity state.

A second major research and training tool developed by NAVTRADEV CEN is the Human Disorientation Device located at the Naval School of Aviation Medicine, Pensacola, Fla. In this research device, the astronaut can experience controlled acceleration around two axes simultaneously, simulating the tumbling action of a space vehicle.

**Survival Trainers.** Other training devices that are being widely used today are the Ejection Seat Trainers and the Dilbert Dunker Trainers.

The Ejection Seat Trainers are used by Aviation Physiologists in training pilots and crew members. The trainer allows the student to actually eject himself from a simulated cockpit, usually in an operational seat, in a manner that very closely simulates an emergency situation. Acceleration forces are also experienced. The Naval Aviation Safety Center credits this device with saving numerous lives.

In the Dilbert Dunker Trainer, the student learns to escape from an inverted sinking aircraft. The student rides a cockpit down a ramp and into

the water. The student then finds himself in an emergency situation; he is upside down in the water and securely strapped in the cockpit. The student must free himself from his harness, communication gear and oxygen equipment and escape from the trainer.

A wide variety of night vision trainers, other trainers and training aids have been developed in support of the Aero-Space Medicine Program. Some of the current programs include:

- Altitude Training, Rapid Decompression Chamber (100,000 feet)
- Aviator's Miniature Oxygen Regulators Demonstrator
- Mark IV, Full Pressure Suit Demonstrator
- Liquid Oxygen Demonstrator
- Aero-Medical Slide-Tape Programs

Several Supporting Research projects are also being conducted which include:

- Bio-Instrumentation for Control of Low Pressure Chambers.
- Internal Environmental Simulator for a Man-Machine System
- Empty Field Myopia
- Reaction Control Simulation

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**DENTAL**



**SECTION**

#### The Oral Fistula: Its Diagnosis and Treatment

I. B. Bender, DDS, and Samuel Seltzer, DDS, 1551 Champlost Ave., Philadelphia, Pa. Oral Surg, Oral Med, Oral Path 14:1367-1376, November 1961.

Oral examinations often reveal the presence of fistulas. Sometimes it is difficult to determine whether it is of periapical, periodontal, or periosteal origin, even when radiolucencies are found. Negative roentgenographic findings make this differentiation even more difficult. The location of the fistulous opening, of itself, is often misleading as to which tooth or tissue is involved.

The fistula may be caused by periodontal involvement, despite the presence of the apical roentgenographic rarefaction. It is necessary, therefore, to determine whether the fistula is of periapical or periodontal origin, so that correct treatment can be instituted. This report offers a method of establishing a differential diagnosis to determine the derivation of the fistula.



Diagnosis is facilitated by the use of a fine stainless steel orthodontic ligature wire, 0.01 inch in thickness. This can easily be introduced into the orifice of the fistula; then, with an easy, twirling motion and very light pressure, the entire fistulous tract can be negotiated. A roentgenogram is taken with the wire in position, and the course of the wire can be traced either to the apex of the tooth or to the periodontal or periosteal area responsible for the fistula. Since the wire bends easily, a false communication is difficult to establish and resistance can be felt.

The diagnostic wire technique may be used (1) to help determine whether a fistula originates from a lesion at the apex of a tooth, from a periodontal lesion, or from a periosteal lesion; (2) to determine from which tooth a fistula has developed when there are two or more adjacent apical radiolucencies; (3) to determine the offending tooth in acute inflammations, where a fistula has not yet developed but where pus has caused fluctuation of the mucosa; or (4) to trace the origin of fistulas found in edentulous regions at distances from remaining natural teeth.

Sometimes, when roentgenograms show two teeth involved periapically and there is marked pain and swelling, it is difficult to establish which tooth has the acute abscess. The acute symptoms are present prior to the formation of a fistula. Here, also, the wire technique is of diagnostic value. The wire is inserted into the fluctuant area and, if maneuvered with an easy, twirling motion, it will negotiate the inflammatory path to the tooth in question.

Usually when a fistula is found, its orifice does not occur directly over the region of involved bone. This is observed when apical surgical procedures are performed. The fistulous opening is frequently found at one level while the eroded bone is at another. The length of the tract and the position of the orifice of the fistula are determined by obscure factors.

Some practitioners have a misconception that the fistulous tract is lined with epithelium and that, therefore, in all cases exhibiting fistulas epithelial tissue must be removed surgically. The authors have not been able to discern epithelial tissue upon histologic examination of these areas. Granulation tissue is seen.

Furthermore, clinical observations reveal that when conservative endodontic therapy is instituted spontaneous closure often occurs after the first or second treatment. Thus, surgical removal of a fistula is unnecessary. Because of the natural drainage provided by fistulas, there are fewer complications (such as pain and swelling) following treatment in fistulization cases than there are following treatment in cases of vital extirpation. Actually, one can anticipate fewer complications in the treatment of pulpless teeth with fistulas than in the treatment of any other endodontic condition.

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### Bone-Soft-Tissue Relation in Lateral Jaw Roentgenograms

Capt D. E. Cooksey DC USN, and Ingram W. Ogden, DDS, Naval Dental School, National Naval Medical Center, Bethesda, Md. Oral Surg, Oral Med, Oral Path 14:493-497, April 1961.

Operations for the surgical correction of malocclusion, whether the jaws are prognathic or retrognathic, result in soft-tissue alteration. The use of a radiopaque paste shows soft-tissue contour and bone relation on the same film. This method provides an excellent basis for preoperative planning and the maintenance of records, as well as accurate postoperative comparison of surgical results.

Barium sulfate powder is mixed with ordinary tap water, creating a thin paste. A camel's-hair brush is used to apply the paste to the soft-tissue contour in the profile position. The desired x-ray films are then taken, furnishing a complete lateral study. The paste is completely nontoxic and can be removed easily.

The material is equally useful for furnishing a radiopaque landmark on the skin for relative orientation of other objects, such as foreign bodies, etc.

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### Visual Aids in Scientific Lectures

D. Verne and R. J. Newhouse, Mount Sinai Hospital, Cleveland, Ohio. J Oral Surg 19:410-417, September 1961; Dental Abstracts 6:686-687, November 1961.

Too many professional men are speaking from prepared papers, and consequently are boring their audiences and making it difficult to understand what is being presented. The lecturer on a scientific subject should avail himself of audio-visual aids—lantern slides, strip films, motion picture films, posters, and the use of a blackboard.

It has been found that employing visual aids results in a gain of about 25 to 35% in factual information presented by a lecturer. Retention of this information is improved about 35% with visual aids.

If a lecturer decides to avail himself of slides, all the slides should be prepared in a professional manner. Most slides should be on the screen for less than a minute; thus, each one should contain only material that can be absorbed readily in that time.

Graphs should be simple, not complex. The lecturer must sum up a table of figures and present an interesting point. He can illustrate his points with a simple colored line, a cartoon or analogous picture. Ready-made cellophane tapes of various widths and designs can be purchased to make bar graphs.



No more than 8 printed lines should be placed on any data slide, and these should fill the entire field. A lesser number of lines is preferable.

If photographs of patients are used, only the essential areas should be shown. The subject should be arranged in anatomic position if possible. A pleasing, plain background of good contrast to the subject should be used. The subject should be illuminated to delineate the necessary structures.

Transparent water colors can be applied to black-and-white prints of the pertinent points of the film. Also one may draw a cartoon on the black-and-white positive print.

Roentgenograms can be made more glamorous by making black-and-white lantern slides to make lines or symbols stand out.

Kodachrome slides can have symbols, arrows, lines or cartoons superimposed on them so that the drawing will appear to be part of the original Kodachrome.

The lecturer can bind his own slides. The film is removed from the cardboard mounts and brushed lightly with a large camel's-hair brush. Then films are placed in silver masks. Glass slides are placed on either side and the edges are taped with a pressure-sensitive binding tape.

A little imagination and a small expenditure of time and effort in preparing visual aids will yield large dividends in helping audiences to understand, absorb, and retain the material presented.

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#### Personnel and Professional Notes

Naval Dental Corps Continuing Education Program. A postgraduate course in Periodontics will be conducted 26 February - 2 March 1961, at the U.S. Naval Dental School, NNMC, Bethesda, Md. This course will consist of lectures, discussions, and clinical demonstrations. Emphasis will be placed on a practical approach to eliminating the periodontal pocket, tissue changes in occlusal trauma, and the systemic aspects of periodontal disease. Surgical procedures will be reviewed.

Capt A. L. Raphael DC USN, Diplomate of the American Board of Periodontics will be the instructor. Quotas for the course have been assigned to the following naval districts and commands: ComThree, ComFour, ComNine, and CNATRA. Quotas for a second course to be conducted 30 April - 4 May 1962, have been assigned to ComOne, ComFive, ComSix, and SRNC. Applications should be received in the Bureau as early as possible and no less than 4 weeks prior to commencement of the course. The Bureau Professional Advisory Board will make recommendations on all requests, and upon approval by the Surgeon General, applicants will be notified as to the final action. Those approved will be nominated for TAD or authorization orders, as appropriate. Accounting data will be forwarded to individual officers nominated for TAD orders.

CAPT Frechette Lectures at Walter Reed. Capt A. R. Frechette DC USN, Commanding Officer, U. S. Naval Dental School, NNMC, Bethesda, Md., participated in a postgraduate course entitled Trends in Dental Laboratory Activities presented 9-11 October 1961, by the Division of Dentistry at the Central Dental Laboratory, Walter Reed Army Medical Center, Washington, D. C. Capt Frechette's lecture was entitled Prosthetic Restorations Associated with Abnormal Jaw Relations.

CAPT Losee Appears at Military Surgeons Meeting. Capt F. L. Losee DC USN, Dental Research Officer, Dental Research Facility, Administrative Command, U. S. Naval Training Center, Great Lakes, Illinois, appeared at the 68th Annual Meeting of the Association of Military Surgeons of the United States held 6-8 November 1961 at the Mayflower Hotel, Washington, D. C. His presentation was entitled Soil Minerals and Dental Decay in New Zealand School Children.

CAPT Spann at Canadian Dental Meeting. Capt S. E. W. Spann, Jr., DC USN, Crown and Bridge Division, U. S. Naval Dental School, NNMC, Bethesda, Md., presented a paper entitled Practical Approach to Functional Full Mouth Rehabilitation at the 36th Annual Fall Clinic of the Montreal Dental Society held 23-25 October 1961, at the Queen Elizabeth Hotel, Montreal, Canada.

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